The American Biology Teacher

OCTOBER, 1957 VOLUME 19, No. 6

Nominations for 1958 Officers

Case History of a Field Trip

Laboratory Experience Units in Biology

TABLE OF CONTENTS

Cover Photograph

A close-up of flower of the Toad Cactus, *Stapelia gigantea*. Picture by Dr. H. L. Dean, Professor of Botany, The State University of Iowa.

THE AMERICAN BIOLOGY TEACHER

Publication of the National Association of Biology Teachers.

Issued monthly during the school year from October to May. Entered as second class matter October 20, 1954, at the post office at Danville, Ill., under the Act of March 3, 1879.

Publication Office—Interstate Press, 19 N. Jackson St., Danville, Ill.

Co-Editors—RICHARD ARMACOST, Department of Biological Sciences, Purdue University, West Lafayette, Ind.; PAUL KLINGE, Coordinator for School Science, Indiana University, Bloomington, Indiana.

The Purdue University address will be the official editorial office. Manuscripts and all publication material may be sent to either of the Co-Editors.

Managing Editor—MURIEL BEUSCHLEIN, 6431 S. Richmond, Chicago 29, Ill.

Subscriptions, renewals, and notices of change of address should be sent to the Secretary-Treasurer, PAUL WEBSTER, Bryan City Schools, Bryan, Ohio. Correspondence concerning advertising should be sent to the Managing Editor.

Annual membership, including subscription, $3.75, subscription to Journal, $3.75, individual copies, $.50, outside United States, $4.50, individual copies, $.50.

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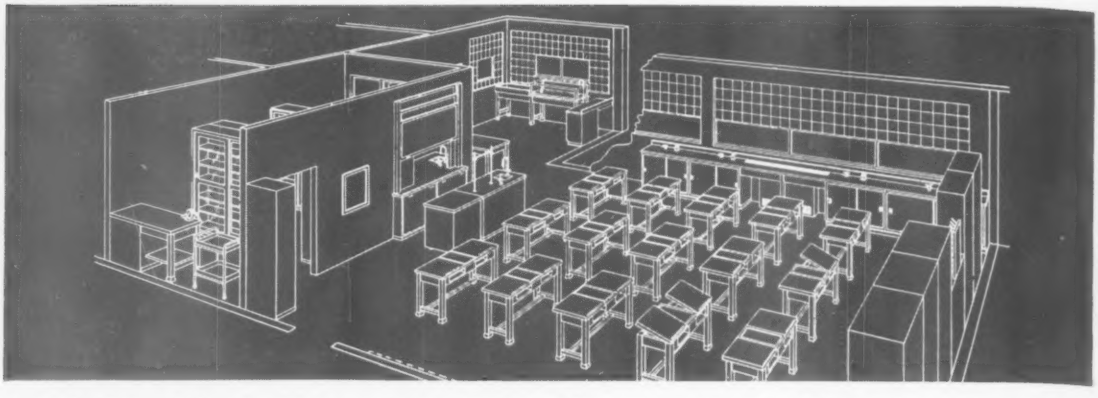


Nominations for 1958 Officers

THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS

In accordance with established procedure, this year's nominating committee has prepared a slate of candidates from persons suggested by NABT members and officers. Biographical information about each candidate is presented in this issue of *The American Biology Teacher*, in the following order: name, present position and location, degrees, experience until present position, NABT activity (offices held, committees, etc.), membership and activity in other organizations, publications. Ballots are being mailed to all NABT members.

Candidate for President-Elect

Rex Conyers

Biology instructor and science consultant, University City, Missouri, public school system; summer faculty at University of Michigan, as director of workshop on camping and outdoor education. B.S. and M.-Ed. (conservation education), University of Missouri. High school teacher for 20 years; developed one of the first large-scale high school conservation demonstration areas, at Independence, Mo.; students consistently are top-ranked at Greater St. Louis Science Fair competitions; leader in workshop and project techniques; consultant for summer camps; instructor for adult evening class in nature recreation. Charter member of NABT; Missouri state membership chairman, 1950-54; midwest regional chairman of Conservation Project; recorder for conservation section, North Central Work Conference on Biology Teaching, summer of 1955; major contributor to NABT's *Conservation Handbook;* vice-presidential nominee, 1954, 1956. Member: AAAS, AIBS, NEA, National Science Teachers Association, Missouri Science Teachers Association (past president), American Nature Study Society (vice-presidential nominee, 1955), Central Association of Science and Mathematics Teachers (secretary, conservation section), Webster Groves Nature Study Society (president, 1955-57); local representative for NABT and ANSS at St. Louis convention of AAAS in 1952; active participant in national meetings since 1948. Author: "Flight Schedule of the Birds of Jackson County, Missouri." Co-author: "Guide to Birding Areas of St. Louis Region." Editor of St. Louis Audubon Society *Bulletin*. Assisted in 1957 revision of biology text. Professional articles in *The American Biology Teacher* and other journals.

Candidate for President-Elect

Paul E. Klinge

Coordinator of School Science, College of Arts and Sciences, Indiana University, Bloomington, Indiana. A.B., Butler University; graduate study at Butler University. High school biology teacher for 15 years; business manager of extra-curricular affairs in high school for much of this time. Member of Executive Board, NABT, since 1954; co-editor of *The American Biology Teacher* since 1954; staff member of North Central Conference on Biology Teaching, 1955; general coordinator for the teaching societies at AAAS Convention at Indianapolis, 1957. Member: AAAS, AIBS, National Science Teachers Association, American Academy of Political and Social Science, NEA, Indiana Academy of Science, Phi Kappa Phi, Kappa Delta Pi; NSTA board of directors; NSTA Commission on Education in the Basic Sciences 1957-59, Institute Review Panel for National Science Foundation, 1956; assistant director of NSF-sponsored Institute for teachers of high school biology, at Indiana University, 1956 and 1957; president of Biology Section, Indiana State Teachers Association 1955-56; president of Alumni Chapter, Phi Kappa Phi, 1955-56; AIBS Committee on Education 1956-57. Ford Foundation Fellowship 1953-54; NSTA Outstanding Science Teacher Award 1952. Has served as speaker, judge and participant at numerous national, state and local meetings. Professional articles in *Clearing House, Educational Digest, School Science and Mathematics, Proceedings of the Indiana Academy of Science, The American Biology Teacher, The Science Teacher, Selected Science Teaching Ideas of 1953*, and *Science Education;* assisted in biology text revision, 1956; co-author of biology text to be released in 1958.

Candidate for First Vice-President

Frances L. Hall

High school science teacher, Atlanta, Georgia; currently working on Science Manpower project at Teachers College, Columbia University, 1956-58; teaching assistant at Barnard College for Women, Columbia University; teaching guides editor for *Science World.* A.B., Emory University, Atlanta; M.A. (zoology), Universersity of Arkansas; Master's dissertation: "Studies on Blood Sugar of the Frog." High school science teacher in Atlanta; teaching assistant in science education at Teachers College, Columbia University, summers of 1956 and 1957; doctoral candidate in science education at Columbia University. Georgia state chairman of NABT Conservation Project; local chairman for NABT part of AAAS meetings in Atlanta, 1955; local arrangements for NABT sessions in AAAS meetings at New York, 1956. Member: AIBS, Georgia Academy of Science.

Candidate for First Vice-President

Dorothy M. Matala

Associate Professor of Biology, Iowa State Teachers College, Cedar Falls, Iowa. A.B., Indiana Central College; M.A. (zoology), Indiana University; Ph.D. (nature study), Cornell University. High School science teacher for 3 years, junior college biology instructor for 3 years, college biology instructor for 11 years. NABT member since 1938; has attended national meetings; speaker at Boston meeting, 1946; recorder at Douglas Lake conference on biology teaching 1955; second vice-president (past), president (past) of Indiana Biology Teachers Association when affiliated with NABT. Member: AAAS (Fellow, 1957), American Nature Study Society, Conservation Education Association (recorder at 2 work conferences), Iowa Science Teachers Association (president, 1956-57), Iowa Academy of Science (Committee on Improvement of Teaching of Science), National Science Teachers Association; co-director of NSF-sponsored Institute for High School Biology Teachers, Iowa State Teachers College, summer of 1957. Professional article in *School Science and Mathematics.*

Candidate for Second Vice-President

Irving C. Keene

Biology teacher at Brookline High School, Brookline, Massachusetts. B.S., Middlebury College; Ed. M., Boston University; summer graduate study at Harvard and Cornell. High school biology teacher for 30 years in Mass. schools. NABT member for years; chairman for NABT at Boston meetings in 1944 and 1950; managing editor of *The American Biology Teacher*, 1947-49; membership chairman for New England states since 1955; member of Planning Committee for North Central Conference on Biology Teaching, 1955; participant at North Central Conference, 1955. Member: AIBS, New England Biological Association (past president); Nominating Committee chairman for New England Biological Association since 1947; Massachusetts chairman for Natural Areas for School Grounds, sponsored by the Nature Conservancy; organized the first Science Fair in Massachusetts, 1935; led the development of a Plant and Wildlife Conservation Center in Brookline, Mass.; speaker at local, state and national meetings. Several professional articles in *The American Biology Teacher.*

Candidate for Second Vice-President

Stanley B. Mulaik

Associate Professor of Biology, University of Utah, Salt Lake City, Utah. B.S., State Teachers College, Pa.; M.S. (nature study), Cornell University; Ph.D., University of Utah. Elementary and high school biology teacher for 5 years; supervisor of nature study at junior high school and college for 7 years; college biology instructor for 18 years; member and director of summer camp staffs for many years. NABT member for years; state chairman for Conservation Project; attended many national meetings. Member: AAAS (Fellow), AIBS, American Nature Study Society (vice-president), Western Division of American Nature Study Society (president), past conservation chairman and present newsletter editor of ANSS, State Camping Association, Society of Systematic Zoology, American Association of University Professors, Nature

Conservancy, Entomological Society of Washington, Utah Nature Study Society (president), Utah Conservation Education Council, South Texas Science Teachers Association, Biology Society of Washington; associate director of NSF-sponsored Institute for Biology Teachers, University of Utah, summer of 1956. Professional articles in *School Science and Mathematics, Texas Outlook, Copeia, Auk, American Museum of Natural History Novitiates, Journal of Mammalogy, Entomological News, Journal of the New York Entomological Society, University of Utah Bulletin, Proceedings of Biology Society of Washington, American Midland Naturalist.*

Candidate for Second Vice-President

Emery L. Will

Professor of Biology and Conservation, and chairman of Science Department, State University Teachers College, Oneonta, New York. A.B., Hobart College; M.S. (biology) and Ph.D. (nature and conservation education), Cornell University. Junior high school science teacher for 2 years; college biology and conservation instructor for 8 years in Iowa and New York; director of Iowa Teachers Conservation Camp, 1952. NABT member since 1949; state and regional chairman for Conservation Project; chairman of Audio-Visual Committee, 1953-57; twice chairman of Nominating Committee; active participant at national meetings of NABT. Member: AAAS (Fellow), AIBS, National Science Teachers Association, NEA, Iowa Academy of Science (Fellow), AIBS, National Science Teachers Association, NEA, Iowa Academy of Science (Fellow), Conservation Education Association, Science Teachers Association of New York State (chairman of science education committee, 1956-57), American Nature Study Society (member, board of directors, 1953-1957), New York State Teachers Association; Institute Review Panel for National Science Foundation, 1956 and 1957. Has served as speaker, judge and consultant at numerous national, state and local meetings; staff member at several teachers' workshops in science and conservation. Professional articles in *The American Biology Teacher, New York State Education, Bios, The Science Counselor;* has prepared audio-visual news column for *The American Biology Teacher* since 1953.

Candidate for Third Vice-President and National Membership Chairman

Robert Smith

Chairman of biology department, DeKalb High School, DeKalb, Illinois. B.Ed. (biology), Illinois State Normal University; graduate study at University of Michigan. Biology teacher and coach in Illinois high schools since 1938; teaching assistantship at University of Michigan in 1946; served as Army parasitologist during World War II. Active on NABT committees; third vice-president and national membership, chairman since 1955; regional membership chairman in 1953; state and regional chairman of Conservation Project; active participant in North Central Conference on Biology Teaching, 1955. Member: AIBS. In Illinois Junior Academy of Science, served as chairman of judging (1941), assistant state chairman (1947), state chairman (1949-51).

Candidate for Secretary-Treasurer

Paul V. Webster

Biology teacher, Bryan High School, Bryan, Ohio. B.A. (zoology), B.S. in Education, M.A., Ohio State University. High school biology teacher for several years. Active at NABT meetings; secretary-treasurer since 1954; former Ohio state membership chairman; steering committee for Southeastern Conference on Biology Teaching, 1954, and for North Central Conference on Biology Teaching, 1955. Life member, National Science Teachers Association. Member: AAAS, AIBS, NEA, Central Association of Mathematics and Science Teachers, American Nature Study Society, Ohio Education Association; served as president and vice-president of Bryan City Teachers Association; advisor to Future Teachers of America chapter; state parliamentarian of the sponsors of the FTA; vice-chairman of Williams County Science Teachers Association, 1956 and 1957.

Mt. Lemmon — A Case History of a Field Trip

LORENZO LISONBEE
Phoenix Camelback High School
Phoenix, Arizona

"Unposed, the camera's record of a moment in eternity. Mr. Tschirley stands in front. Dr. Marshall, ornithologist, holding monocular, is making bird calls. Students gaze aghast at birds' response."

September 30, 1955

Dr. W. S. Phillips
Head of the Department of Botany and Range Ecology
University of Arizona
Tucson, Arizona

Dear Dr. Phillips:

Approximately 100 biology students from the Phoenix Camelback High School will be travelling to Mt. Lemmon, Saturday, October 9, as an activity in a unit on life zones of Arizona. We will be travelling by chartered buses.

We would like to invite someone from the University to accompany us who would serve as a guide-lecturer–someone who knows the flora, who knows the mountain, who understands the life zone concept, and who would be able to be heard and understood by a hundred 10th grade students in open country.

Of course, a high school biology unit on life zones would be elementary. Life zone maps of the state have been made by the students, a few dominant trees and shrubs have been listed that are indicative of each zone, and attempts have been made to help students understand the relationship between plants and animals and the environmental conditions in which they live.

We would be arriving in Tucson near 10:00 a. m., October 9. We would be very happy to have one or more of you accompany us in this capacity.

Could we hear from you by return mail?

Cordially,

L——— (Biology)

October 2, 195—

Mr. L———
Phoenix Camelback High School
4612 N. 28th Street
Phoenix, Arizona

Dear Mr. L———:

Your letter to Dr. Phillips has been passed on to me since Dr. Phillips is on a Fulbright Fellowship for ten months in Australia.

In reply to your request, we will be most happy to guide your students on a trip through the Mt. Lemmon area. I am making arrangements now for qualified leaders of the group. One of the guides I have in mind must be back in Tucson by 5:30 p. m. on October 9. If you feel that from 10:00 a. m. to 5:30 p. m. will give your students sufficient time to study the flora, geology, etc., please let me know by return mail so that we may make the necessary arrangements.

In regard to the trip we have in mind to make three stops going up the mountain. This would take about three hours and the third stop would be on top of Mt. Lemmon and would include lunch. Please inform me what arrangements you wish to make for the lunch period.

Sincerely yours,
E. B. Kurtz, Acting Head
Department of Botany

Dear Parent:

The biology classes at Phoenix Camelback High School are completing a unit on the life zones of Arizona. As a "clincher" for the unit an excursion is planned to Mt. Lemmon, in the Catalina Mountains near Tucson, for those students who might be interested in such an activity.

The group will travel by chartered buses. There will be faculty supervision in each bus. Parents are invited to accompany the group. Students participating in this activity will be expected to make a report of the trip.

Date: Saturday, October 9, 195—. Time of departure: 8:00 a. m. Approximate time of returning to Camelback High: 6:00 p. m. Total miles traveled: 370. Cost per student for bus fare: $5.50. Students will provide their own lunches.

Students who are planning to go should pay the bus fare at the book store and take the receipt to their biology teacher no later than 4:00 p. m., Wednesday, October 6.

If you approve your son or daughter going, would you please sign below. It should be understood that the school can not assume responsibility for accidents, though every precaution will be taken to assure safety of all.

October 4, 195—

Mr. E. B. Kurtz
Department of Botany
University of Arizona
Tucson, Arizona

Dear Mr. Kurtz:

In regards to your letter of October 2— Thanks. Sounds very good.

There will probably be about one bus load of students making the trip. Students will take sack lunches for the noon meal.

Where shall we meet you, say between 9:45 a.m. and 10:15 a.m.?

We look forward to an exciting day.

Cordially,
L———

October 6, 195—

Dear Mr. L———:

I will dash this off by pen so that you will have the following information in time. I have arranged for two guides for your trip. They are Mr. Fred Tschirley, of the Range Management Dept., and Dr. Joe Marshall, zoologist. They will meet your group at 9:45 a.m. in front of the Agriculture Building here on the campus. They will then conduct the tour, and if all goes well it should take about three hours to get to the top of Mt. Lemmon. This will be lunch stop and also a point for discussion. Any time remaining can then be spent as you and Tschirley and Marshall decide. I believe you will find the trip well worth the effort.

Very sincerely,
Ed Kurtz

INFORMATION SHEET

MT. LEMMON EXCURSION, OCTOBER 9

1. Busses will start loading at 7:30 a.m. in front of the Gym. We plan to leave shortly thereafter.
2. Take a sack lunch for the noon meal.
3. Take a notebook for note taking.
4. Slacks or similar apparel suggested for girls.
5. Dr. Joe Marshall and Mr. Fred Tschirley from the University of Arizona will accompany us as guide lecturers. We will meet them in front of the Agriculture Building at the University of Arizona.
6. At lecture stops, load and unload the bus quickly. Listen carefully to what the University people have to say. Take notes of important information.
7. Lunch will be eaten after the lecture at the third stop, near the summit of Mt. Lemmon. Further instructions will be given at this stop.

Suggestions for your report:

List as many plants as you can see and name between Phoenix and Tucson. List the names of mountain ranges you can identify between Phoenix and Tucson. Use maps to help you locate the mountains. Give the location of mountains in relationship to the towns we pass through. Keep a travel record. Give arrival and departure times at towns we go through, etc. Make a detail report of what you see and hear as we go up Mt. Lemmon.

October 11, 195—

Dr. Edwin B. Kurtz, Acting Head
Department of Botany
University of Arizona
Tucson, Arizona

Dear Dr. Kurtz:

A note of appreciation. We all had a wonderful time Saturday. Dr. Marshall and Mr. Tschirley clicked with the students, and a great deal was learned from them.

It was also our good fortune to happenstance upon Dr. Butler in Bear Wallow collecting pine aphids. He graciously took time out to tell us a number of things about his work. A most opportune coincident. We had just gotten into a unit on insects in our classwork, and had been talking about entomology and entomologists, and here appeared an entomologist in "the flesh."

Again, thanks for everything.

Sincerely,
L———
(Biology)

Brief Log:

Left Phoenix Camelback High School Gym at 7:51 a.m.

Arrived University of Arizona campus at 9:20 a.m.

Arrived Bear Wallow near summit at 12:30 p.m.

Left Bear Wallow for home at 2:20 p.m.

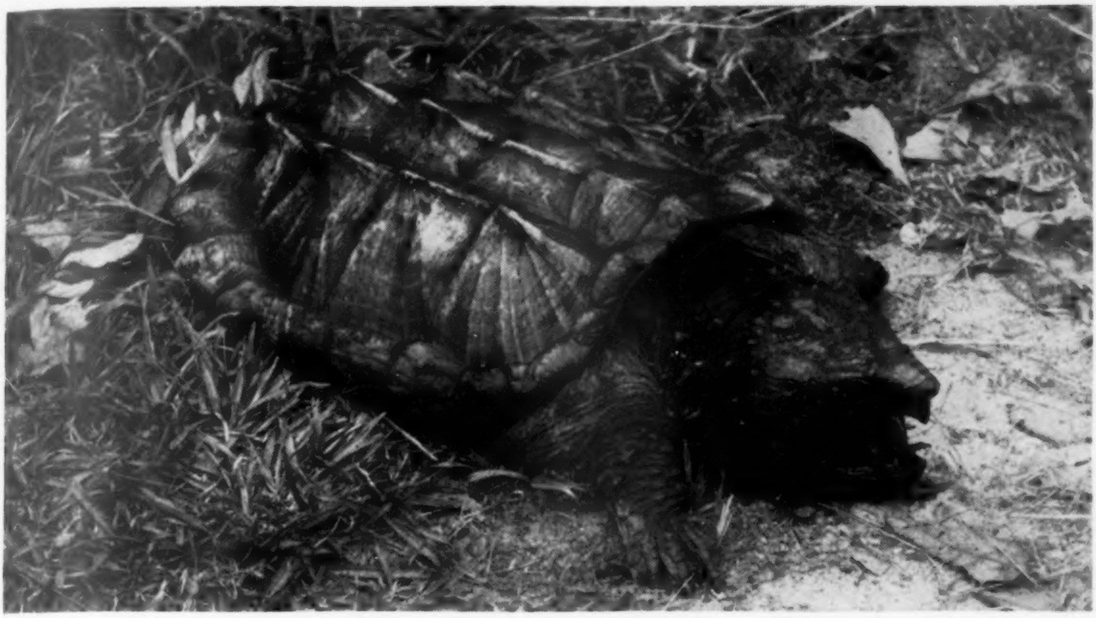
Arrived Phoenix Camelback High School campus at 6:15 p.m.

Turtle Heart Beats Five Days After Death

ALBERT JOHNSON, JAMES CLINTON, and ROLLIN STEVENS
Chipola Junior College, Marianna, Florida
Department of Biology

A Chelonian identified as a female Alligator Snapping Turtle weighing some 25 odd pounds and 26 inches long was caught in Merrits Mill Pond, Marianna, Florida, by a Chipola Junior College student, John Payne.

The turtle was decapitated and dissected for a study of its heart and circulation, with a further examination for possible helminthic infestation. Following dissection by members of the Biology Department, the cadavar was placed in the refrigerator from Thursday to



Close-up of Alligator Snapping Turtle.

the following Monday. During the interim, daily observations were made.

It was evident that the chilling slowed down the apparent progression of cardiac contractions to the point that the advancement of contraction could be followed easily. But the heart remained active, beating at a slow rate before final cessation of systolic and diastolic movements. No stimulus of any kind, mechanical or biochemical, was attempted, so that cardiac beats were continued naturally for five days after demise, even under constant refrigeration.

The turtle was remarkably free from endoparasitic infestation considering the nature of the Florida swamp bank upon which she was found. Two coiled nemathelminthes about ¾ inches long were imbedded in the peripheral interlobular tissues of the lungs. They were tentatively identified as pulmonary strongylids.

Four platyhelminthes as flukes were taken from the duodenum. These helminthes have been sent to the Department of Parasitology, Florida State University at Tallahassee, Florida, for final taxonomy and identification.

Ant Houses

THOMAS P. BENNETT
Florida State University
Tallahassee, Florida

Efficient observation houses for ants have been constructed very cheaply in a simple manner. For one house the following materials are needed:

2 picture frames with glass

4 strips of wood the width of the wooden portion of the frame and about ½ an inch in thickness.

2 strips are cut to the length of the frame and 2 strips to the width.

Small nails and a few tools

Putty is used to secure the glass in the frames. The wooden strips are then nailed on to the wooden portion of one of the frames. The other frame is then nailed onto this structure to give a sandwich effect as illustrated. A strip of adhesive tape is then used to seal these junctures. A small hole is drilled in the top of the house through the stripping to provide a portal for the introduction of ants and to provide a passage for air if the hole is loosely plugged with cotton. A stand can be made from two boards which have been slotted to receive the frame structure.

Laboratory Experience Units in Biology

B. JOHN SYROCKI
State University Teachers College
Brockport, New York

Radiant Energy and Food Production in Plants

Principle to Be Developed

The ultimate source of all energy is sunlight and this energy is bound into food materials during photosynthesis.

Activities in the Unit:

A. Role of Sunlight in Photosynthesis
B. Storage of Food in Seed Leaves
C. Release of Stored Energy During Germination of Seeds

Procedures

A. *Role of Sunlight in Photosynthesis.*—Obtain two geranium, Coleus, or fuchsia plants and place them in a dark place for two days. The plants may be placed in a closet, or under a paper box. After two days, put one plant in direct sunlight for several hours. Remove two leaves from the plant which has been placed in direct sunlight, and two leaves from the plant which has been in total darkness. Nick with a razor, or otherwise mark those leaves which had been in sunlight, and immerse the four leaves in boiling water for two minutes to kill the leaves. Remove the leaves and put them into a Petri dish containing hot wood alcohol (rubbing alcohol). Let the leaves remain in the alcohol for ten minutes, or until all traces of green coloring in the leaf have disappeared. [Heat the wood alcohol in a narrow-mouthed pyrex flask, then pour the alcohol into the Petri dish.] Cool ditto fluid has been found to be satisfactory for removing the chlorophyll, however the leaf has to remain in the fluid for a few hours.

Remove the leaves from the alcohol and put them into a solution of iodine in a Petri dish [Iodine Solution: 1 gram of potassium iodide and ¼ gram iodine in 10 cubic centimeters of water. Mix the sodium and potassium iodide thoroughly, and add water to make a total of 250 cubic centimeters of solution]. Note the reaction of the leaves to the iodine solution. Try some of this iodine solution on some laundry starch, on a piece of potato, and on a piece of bread. Record the reaction of iodine with starch.

B. *Storage of Food in Seed Leaves.*—Fill a large drinking glass half-full with dry lima beans, and cover them with water overnight. The next day, split open the seeds, and put several drops of iodine solution on each half of the seed, as shown in Diagram 7. Record the changes that take place and determine whether or not the change is prominent over all parts of the surface of the lima bean seed leaves.

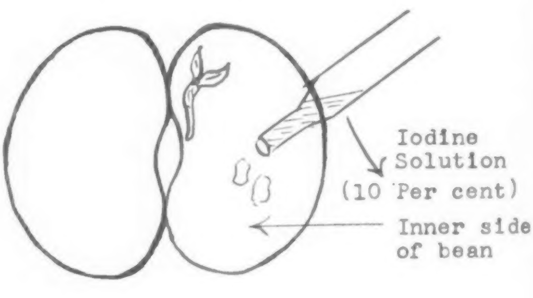


DIAGRAM 7

C. *Release of Stored Energy During the Germination of Seeds.*—Fill a large drinking glass half-full with dry, packaged lima bean seeds, and cover them with water overnight. Bore a hole one-quarter of an inch into the center of a cork of a thermos bottle (one pint capacity). Insert a Fahrenheit thermometer into the cork so that the bulb of the thermometer reaches about halfway into the bottle. Put the seeds in-

to the thermos bottle, add about a third of a cup of water, and replace the cork. Seal the cork to the bottle with plastic clay, and seal around the thermometer in order to prevent heat from escaping from the bottle, as shown in Diagram 8.

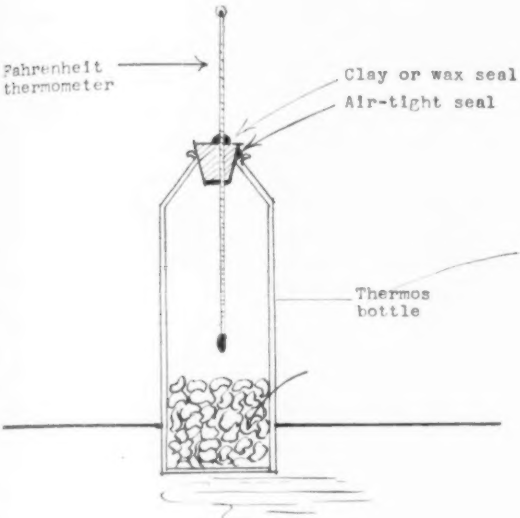


DIAGRAM 8

Keep the bottle out of direct sunlight or other heat sources. Record the temperature in the inside of the bottle, and repeat the reading after fifteen minutes to obtain a correct reading of the temperature inside the bottle. Repeat readings during the second, third, and fourth days. Keep a record of the temperature inside the bottle during the time from onset of germination until the fifth day, and construct a graph to show the changes which have taken place.

Appended Questions

1. In the experiment on photosynthesis, of what value was the "control plant"?
2. What was the purpose of removing the green coloring matter in the leaves with alcohol?
3. What can be said with regard to the value of using iodine solution as an indicator of certain food materials?
4. What are some probable reasons for the results in the activity concerned with the release of energy during seed germination? What was the original source of this energy?
5. Where does the plant get food material during its growth from a seed to a seedling?

Outcomes

Specific Understandings

1. Energy from the sun is necessary for food production by a green leaf.
2. A seedling obtains its food supply from food stored in the seed leaves, or cotyledons.
3. Heat energy is released during seed germination since the food is oxidized, thereby releasing bound heat energy.
4. The energy stored in a seed leaf has its origin in the sunlight used during food production.

The Transportation System in the Human Body

Principle to be developed

In man, food and oxygen are carried to all parts of the body through a system of blood circulation.

Activities in the Unit:

A. Viewing of the film *The Heart and Circulation*
B. Blood Circulation in Capillaries
C. Pumping Action of the Heart in the Frog
D. Study of a Beef Heart and Model of the Human Heart
E. Heart Beat and Arterial Pulse (Human)
F. Effect of Exercise on the Rate of the Heart Beat

Procedures

A. *Viewing of the Film* The Heart and Circulation.—To the instructor: Students will be asked to observe the film on the heart and circulation. This film will be used to introduce the subject of the transportation system in the human body for the following reasons: (1) Movement of the heart can be introduced at this time to all students since the film captures motion [students will observe the beating of the heart of an animal in further study], (2) the

motion picture through its animated drawings can present a process which is difficult to perceive about the human heart in the laboratory, and (3) the film makes it possible for the group as a whole to participate in a common experience which should prove helpful in further studies about the human heart.

Prior to the showing of the film, the instructor should discuss the general aspect of the circulatory system, pointing out the principal functions of this system. The action of the heart as a pumping station, and the meaning of a closed system of circulation should be emphasized. The students need to be oriented with respect to some of the content which they are to observe, hence the use of a model of the human heart, a chart, or reference to drawings during a brief talk about the circulatory system should prove most helpful at this time. Students should be instructed to pay special attention to the following during the showing of the film:

1. The rhythmic beating of the heart in the experimental animals.
2. The function of the heart valves.
3. Path of blood through the heart.
4. The origin of the pulse beat.
5. The nature of the different kinds of blood vessels comprising the transportation system in man.

B. *Blood Circulation in Capillaries*—Wrap a small aquarium fish or tadpole in moist cotton, exposing the tail of the animal. Put the animal on a piece of glass about four by five inches, as shown in Diagram 9.

Examine the thin end of the tail with a low power of a microscope, and look for tiny blood vessels through which blood is flowing. Keep in mind that both the size of the blood vessels and the speed of flow of blood in these vessels are exaggerated when viewed with a microscope. Look for blood vessels of different sizes and compare the flow of blood in these vessels.

In the event fish are not available, an anaesthetized frog can be used. Cut out a hole equal to the size of the opening in the stage of the microscope, in a piece of cardboard 4 x 8 inches. Pin the outstretched web of the frog's leg over the aperture in the cardboard and superimpose this aperture over that in the stage, as shown in Diagram 10.

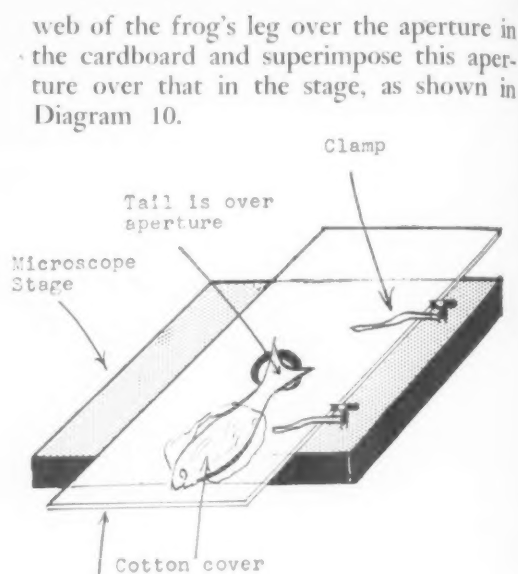


DIAGRAM 9

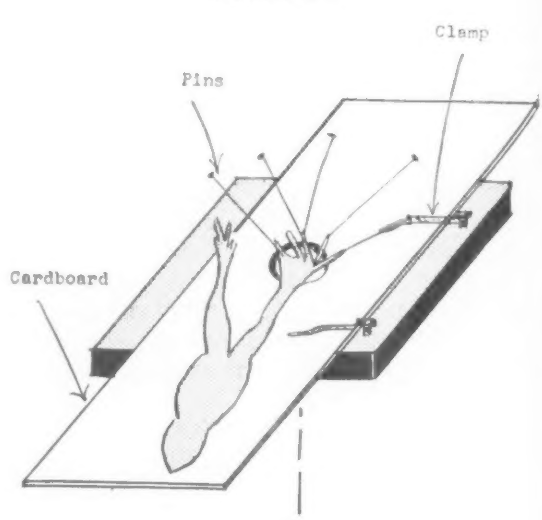


DIAGRAM 10

Examine the web for tiny blood vessels in the thin membraneous portion of the web. Compare the speed of flow of blood in the larger vessels in the web with that in the much smaller blood vessels. As in the fishtail, both the speed of blood circulation and the size of the blood vessels are greatly exaggerated when observed by a microscope.

C. *Pumping Action of the Heart in the Frog* —Examine a demonstration of an anaesthetized or pitched frog showing an exposed heart. Note that the tissues over the heart have been removed with scissors and/or scalpel, and that the incision had to be made slightly to the left because of the sternum, or bone in the thoracic cavity. This bone had to be cut in order to expose the heart.

Observe the contraction of the heart, and ascertain by observation which part of the heart appears to contract with greater force. Record the rate of the heart beat in terms of the number of beats per minute, then pour warm water over the heart and record the rate of the heart beat again. Pour a few drops of ice water over the heart and observe the effect of cooling the heart.

D. *Study of a Beef Heart and Model of the Human Heart*—Examine a beef heart which has been cut longitudinally by your instructor to expose the chambers of the heart. Examine as follows:

1. Find the large, rather heavy-walled vessel which emerges from the left side of the heart. Compare the thickness of this vessel with the large blood vessels which lead into the upper right chamber of the heart.
2. Compare the walls of the two upper chambers of the heart with the walls of the lower chambers of the heart.
3. Examine the valves of vessels carrying blood away from the heart (vessels carrying blood away from both of the lower chambers of the heart), and the valves between the upper and lower chambers on both sides of the beef heart.
4. Examine the wall of muscle which divides both sides of the heart. Determine whether or not it would be possible for blood to go from the right side of the heart to the left side without going out of the heart.
5. Examine the model of a human heart and compare your observations of the beef heart with the structure of the human heart, using a model of the human heart.

E. *Heart Beat and Arterial Pulse (Human)*—Find your pulse by placing your forefinger and the two adjoining fingers on your left wrist at the points indicated in Drawing 11.

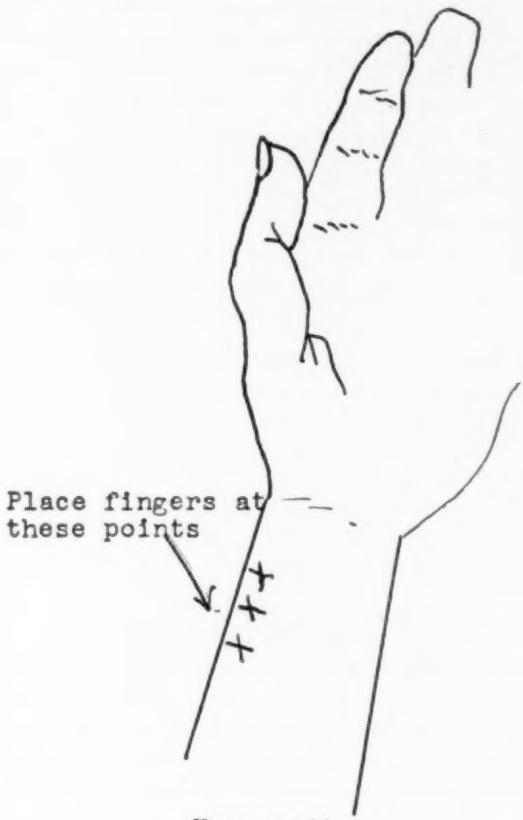


DIAGRAM 11

Now try to find your partner's pulse in the same manner as you have found your pulse. Keeping one hand on your partner's pulse, find your partner's heart beat using a stethoscope. Does the heart beat and the pulse beat register at the same instant?

Determine the rate of the heart beat per minute, by taking three readings and calculating the average heart rate. Determine the rate of the pulse beat and compare this rate with the heart rate.

F. *Effect of Exercise on the Rate of the Heart Beat*—Ask your partner to sit down and rest for a few minutes. Calculate the average pulse beat per minute while at rest. Next, ask your partner to jump alternately on each foot twenty-five times. Immediately after the exercise, tell your partner

to sit down and proceed as follows:

1. Immediately take the pulse and count the number of beats for 30 seconds. Record the number of beats but be sure to keep your fingers on the pulse.
2. Rest for 30 seconds.
3. Take the pulse for another 30 seconds. This constitutes the one-minute reading. Record the pulse beat.
4. Rest for 30 seconds.
5. Take the pulse for another 30 seconds. This constitutes the two-minute reading. Record the pulse beat.
   Continue taking 30-second readings until the pulse rate per minute approximates the pulse rate while at rest.

Record your observations on the blackboard, indicating the pulse rate at rest, the pulse immediately after exercise, and the pulse rate at one-minute intervals subsequent to the reading after exercise. Calculate the average pulse per minute for your class. What is the average number of minutes required for the pulse to return to the rate at rest after exercise?

Appended Questions

1. Assume that you are a witness to an accident in which the individual has just cut his arm. The blood is spurting out from a vessel, and you are faced with the problem of helping to stop the flow of this blood. Is the blood coming out of a vein or artery, and where would you plan to apply pressure? What reasons would you offer in defense of your intended action?
2. Blood is flowing from a cut in the forearm in an even flow. How would you attempt to stop the flow of this blood? Would you apply pressure above or below the location of the cut on the arm? What reasons would you give in support of your action?
3. What part of the heart structure indicates that blood must leave the heart before it can go from the right side of the heart to the left side? Where does the blood go in the meantime?
4. In what ways would you consider the human heart to be like the beef heart?
5. Explain the formation or origin of the arterial pulse, and its ultimate disappearance in the veins.
6. Why is it likely to be expected that the musculature of the lower chambers of the heart should be greater than that of the chambers of the upper part of the heart?
7. Explain the action of the valves of the heart. What is referred to as a "heart murmur"?

Outcomes

Specific Understandings

1. The blood is sent out into a system of blood vessels under the pressure of the contracting muscles of the heart.
2. The heart is a muscular organ capable of exerting strong and continuous pressure.
3. Blood courses through a closed system of blood vessels.
4. The flow of blood in arteries is under direct influence of the beating heart and the elasticity of the walls of arteries, hence the spurting movement of blood in arteries. As blood continues into capillaries and then into the veins, the pressure forcing the blood to move away from the heart is lost.
5. The pulse beat in the wrist reflects the beating of the heart.
6. Valves located in strategic places in the heart and in certain blood vessels helps to channel blood in specific directions.

Transmission and Distribution of Bacteria

Principle to Be Developed

Disease germs may be spread from one place to another through different media; dust, liquids such as sputum, and droplets which are given off during coughing and sneezing. In some instances, food is a carrier of disease germs.

Activities in the Unit:

A. Preparation of sterile media, sterile swabs, and sterile glassware
B. How Microbes Are Carried from One Place to Another: Dust, Personal Objects, and Droplets.
C. Microscopic Study of Bacteria
D. Food as a Carrier of Bacteria

A. *Preparation of Sterile Media, Sterile Swabs, and Sterile Glassware—*

1. *Sterile media.* Obtain nutrient agar which is available in powder form [the agar will be supplied by your instructor who will procure the agar from a biological supply house], and follow directions on the bottle to make 300 cubic centimeters of agar medium. Dissolve the agar in 200 cc. of water in a flask, and bring the solution to a boil. Allow the solution to cool, but not to the point where the agar begins to gel. Pour the agar into a 500 cc. graduated cylinder, or into a container so marked as to indicate the level at which 300 cc. would be contained in the container. If a large graduated cylinder is not available use a small one, pouring 300 cc. of water into a container and indicating the 300 cc.-level with adhesive tape. Add water to the agar to make 300 cc. of medium, and pour off 150 cc. of the agar into two smaller flasks. The agar is ready for sterilization.
2. *Sterile swabs.* Twist some absorbent cotton about the thicker ends of a toothpick, preparing at least a dozen of such swabs. Put the swabs into a test tube and plug the tube with cotton so that the cotton plug extends about one inch into the tube and one inch out of the tube for easy handling. The swabs are ready for sterilization.
3. *Sterilized Petri dishes.* Wash and dry a dozen Petri dishes. In the event the dishes are to be sterilized at home in an oven, wrap each dish in newspaper and secure the paper to the dish with string. Use a bow knot to facilitate the removal of the paper from the plate at the time of pouring the agar plates.
4. *Sterilization process.* Put a cotton plug into the flasks containing the agar solution. Put the flasks, swabs, and glassware into an autoclave for 20 minutes at 15 pounds pressure. Your instructor will help you to get this material sterilized for you, or you can have this done for you at your nearest health laboratory. Should this form of sterilization be impossible, then put all materials into an oven for 45 to 60 minutes at a temperature of about 360 degrees Fahrenheit.
5. *Pouring agar plates.* Remove the cotton plug from one flask of agar, flame the lip of the flask over a flame, and proceed as follows:
   a. Raise the cover of a Petri dish and pour in enough agar to form a layer of agar about one-quarter of an inch thick, as shown in Diagram 25.

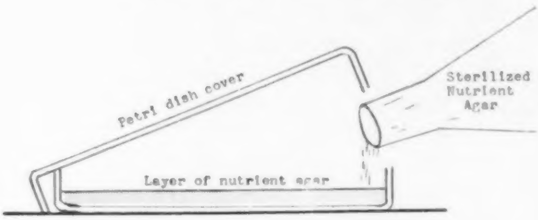


DIAGRAM 25

   b. Replace the cover and stir the entire dish in a clockwise rotation to remove all air bubbles. Stir gently enough so that agar will not spill over the lip of the dish.
   c. Let the agar harden, then invert the dish with its cover and put the agar plates into the refrigerator.
   d. Prepare a dozen agar plates this way.

B. *How Microbes Are Carried from One Place to Another: Dust, Personal Objects, and Droplets*—Inoculate agar plates as follows:

1. Remove the cover of one agar plate for thirty minutes. Replace the cover and label this plate "Exposed to Air." Use a glass marking pencil or gummed labels.
2. Rub a dust cloth over some dusty furniture. Remove the cover of one agar plate and shake the dust over the agar. Label this plate "Exposed to Dust."
3. Rub a pocket comb gently over the agar in a Petri dish, and label this agar plate "Exposed to Personal Item—Comb."
4. Put a penny on the agar, remove the penny and label "Handled Objects—Money."
5. Remove some of the dirt from underneath the fingernail and "roll" the dirt

over the agar. Label this plate "Dirt from Fingernails."

6. Touch the agar with a *soiled* handkerchief, and label the agar plate "Nasal Secretions."
7. Let two or three drops of tap water fall on the agar and label this agar plate "Exposed to Tap Water."

Set two agar plates aside without inoculating these plates and label them "Control Plates." Keep all agar plates at room temperature and examine them at the end of 24 hours and again at 48 hours. Count the number of colonies of bacteria (small bodies or aggregates of bacteria which will appear usually as white to gray bodies) and record the number of colonies in each plate which has been inoculated as well as the "control" plates.

C. *Microscopic Study of Bacteria*—To be sure that the colonies on the agar plates are bacteria, and to see bacteria with the aid of a microscope, obtain the following materials:

1. Several microscope slides.
2. A wire loop which is to be constructed as shown in Diagram 21.
3. A solution of gentian or crystal violet (to be supplied by the instructor).
4. A glass dish, or metal pan approximately 5 inches wide, 8 inches long, and 3-4 inches deep.
5. Two pieces of glass tubing 12 inches long, and one piece 6 inches long.
6. A small metal file.
7. A drinking glass.

Prepare a wire loop as follows: Heat one end of a piece of glass tubing twelve inches long until it is red hot and in a molten state. Insert a piece of nickel, nickel silver (electric-resistance wire), or steel wire about four inches long into the tip of the glass tube, as shown in Diagram 21.

Preparing and staining slides of bacteria. Set up a staining dish as shown in Diagram 27. To prepare the cross pieces of glass tubing it will be necessary to cut glass tubing. Measure off 3 inches on the glass tube and scratch into the glass at this point with the edge of a metal file. Take the tube in both hands, holding the tube with the side which has been scratched away from you. Press forward and crack the tube at the point where the scratch is located. The tube will break easily, and without much force.

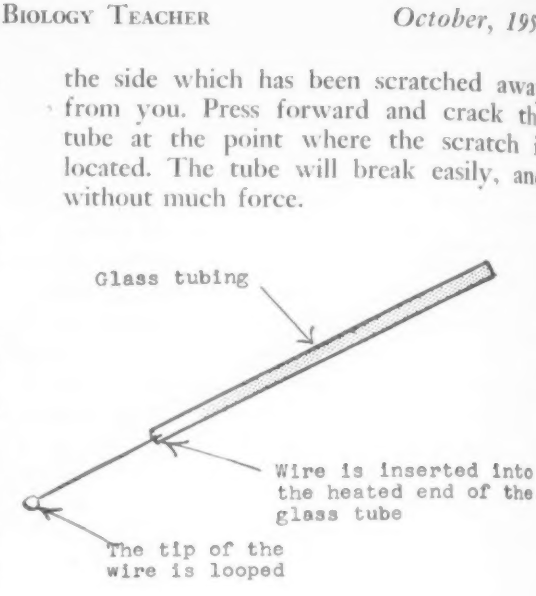


DIAGRAM 21

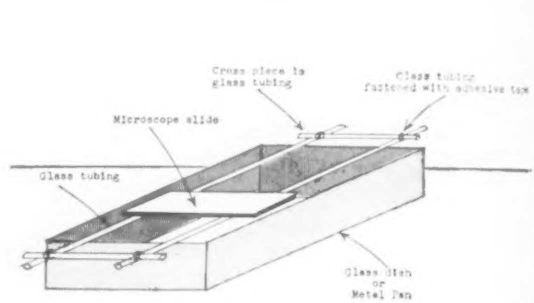


DIAGRAM 27

Put a drop of sterile water, or tap water in the center of a microscope slide. Put the end of your wire loop into the flame until it becomes red hot, in order to kill any organisms which may be present on the loop. Let the wire cool off, then pick off a single colony of bacteria from an agar culture plate of any of the first six agar plates which you had inoculated in Activity "B" of this experience unit. Mix the bacteria with the water to form a film about one-half inch in diameter. Flame the slide gently to speed up the drying of the film. This heating also helps to affix the film to the slide so that the bacteria will not wash off during the staining process. Put the slide on the glass holder over the dish, and add enough gentian or crystal violet to cover the film on the slide. Stain the bacteria for two minutes, then wash

the dye away from the slide with water. Blot the film against a white absorbent paper such as mimeograph paper or filter paper. Put a drop or two of immersion oil, or mineral oil on the slide and examine the film under the low and high powers of your microscope.

D. *Food as a Carrier of Bacteria.*—Sandpaper a spot on the skin of an unspoiled orange. Touch this spot to the skin of an orange showing considerable decay in this area. Let the unspoiled orange remain at room temperature for several days. To direct immediate attention to the spot which is rubbed against a spoiled orange, draw a circle around this area with a glass marking pencil or with ink.

Obtain two apples, one which appears unspoiled, the other showing a definite area of spoilage. Sterilize a fork by immersing the forked end into 70 per cent alcohol, or into commercial rubbing alcohol. Plunge the fork into the decaying portion of the apple, then stab an unspoiled apple once or twice. Let the unspoiled apple remain at room temperature for a few days. Observe the apple each day, and record the changes that are taking place.

Appended Questions

1. Situation: During the beginning of the school year, one third grade teacher asked each child to bring a large box of cleansing tissues (kleenex) for their use during the school year.
   Question: What necessary precaution has this teacher taken in this class? What may have been the reasons why this teacher has taken this action?
2. Situation: A child is trying to help with the cleaning in the home and starts to sweep the rooms, including sweeping the rugs and in general stirring considerable dust into the air.
   Question: What possible menace is this situation to the child and to others in the home? Base your reasoning on your experience in this unit.
3. Situation: A public washroom maintains paper towels in a dispenser for public use.
   Question: Discuss the merits of the use of paper towels versus usage of a single cloth towel which may be changed from time to time by a caretaker.
4. Situation: A mother suffering from nasopharyngitis decides to feed her infant. Before coming near to her child, she decides to put on a sterile face mask.
   Question: Of what value are these precautions to the child? How can a sterilized mask be of help in this situation?
5. Situation: It was found that one apple in a bag of apples shows signs of decay.
   Question: What precaution should be taken promptly? Upon what reasons would you base your actions?

Outcomes

Specific Understandings

1. Microbes may be spread from one infected area of one object to another object through contact.
2. Microbes may be spread through dust particles which act as a vehicle for bacteria.
3. Bacteria may be carried through human nasal secretions, or tiny droplets emitted during coughing or sneezing.
4. Bacteria are carried on personal objects such as combs.
5. Certain parts of the body house bacteria; bacteria may be found abundantly under the fingernails.
6. Certain household duties involving uncontrolled cleaning, may enhance the spread of disease throughout the household.
7. Certain household practices may involve the use of articles which may foster the spread of bacteria.
8. Certain household and community practices may affect the carriage of microbes from one place or person to another place or person.

Discovery of a new antibiotic which may help combat a variety of crop diseases was announced by Dr. Odette L. Shotwell of the United States Department of Agriculture. He reported that the compound, named Duramycin, was obtained from an antibiotic mixture which is effective against several maladies afflicting beans, wheat and bluegrass. The new antibiotic was named Duramycin because it has proved to be very stable against heat.

An Advanced Biology Course in High School

WILLIAM KASTRINOS
Glenbard High School, Glenn Ellyn, Illinois

Advanced Biology has been offered at Glenbard High School for a number of years. It is not geared for Advanced Standing or Placement in College, but is a second year biology course offered for the student interested in some phase of biology as a future. Students are selected on the basis of the Nelson Biology Achievement Test plus the recommendations of their instructors. The counseling staff interviews those interested. They are encouraged to take Chemistry and Physics and not use Advanced Biology as a substitute for either.

The greatest emphasis in Advanced Biology is in laboratory work and a great deal of freedom during school and after class is given the student in the use of laboratory equipment. Some of the areas in which the students work are:

I. **Cat Dissection.** Each student is given a doubly injected cat and all of the systems of the cat are studied in detail.

II. **Physiology Experiments.** Students work in groups of three and perform experiments on frogs, turtles and classmates. Kymograph, signal magnets, etc., are used after the student has been instructed in their use.

III. **Individual or Small Group Projects.** Students are required to work on a project. The use of live material is encouraged. This work varies from nutrition experiments to experiments on the endoctrine system, and is done on the students' own time. A careful check is made on the student who must turn in progress reports and reference lists. The students feel free to use the laboratory and have done a fine job in maintaining it.

IV. **Class Program.** Groups of three students are required to put on a program for the class, covering a field in Public Health or a particular profession. They are encouraged to contact speakers to come in as a part of their program. This year we have had a public health officer, medical technologist, a bio-chemist, a nurse, a speaker from the TB office, and a representative from Alcoholic Anonymous.

V. **Field Trips.** In the last two years we have gone to the Morton Arboretum, Palos Park, a local dairy, Northwestern University, and the County Public Health Exhibit.

VI. **Science Club Program.** Once a year we present a program for our Science Club. A typical program might include vagus inhibition of the turtle heart, and an explanation of the handling and care of live laboratory animals.

Books for Biologists

THE WORLD OF BEES, Gilbert Nixon, 214 pp., $4.75, Philosophical Library, New York, New York, 1955.

Bees have been a source of interest since ancient times. In this book Mr. Nixon has tried to give the reader a glimpse of the whole world of bees in all their intriguing diversity of habit and behavior.

Every aspect of bee life is covered: development from egg to adult; courtship; nest-making; care of the young; social life; the strange ways of the cuckoo bees; pollen collecting; the "language" of the bees; etc. The answers to many important questions in non-technical explanations.

EVOLUTION: THE AGES AND TOMORROW, G. Murray McKinley, 275 pp., $4.00, The Ronald Press Company, New York, New York, 1956.

This book synthesizes facts and theories from many branches of knowledge to present an interpretation of evolution that gives a fresh understanding of man, the world of nature, and man's position in that world.

HYPNOTIC SUGGESTION, S. J. VanPelt, 95 pp., $2.75, Philosophical Library, New York, New York, 1956.

This book tells the general medical practitioner and those intending to specialize in the treatment of psychoneurotic and psychosomatic disorders what they need to know about the modern method of treating these disorders by hypnotherapy. (Continued on page 187)

Books for Biologists

(Continued from page 186)

CLIMATES IN MINIATURE, T. Bedford Franklin, 137 pp., $3.75, Philosophical Library, New York, New York, 1955.

Nature-lovers will find in this book something to interest them and an invitation to follow a fascinating hobby. With simple and cheap apparatus, fully described in the book, the author has carried out experiments showing how some animals keep warm in the winter, the role of different soils and their temperatures, the way to forecast frost and achieve protection against frost damage, the effects of humidity, windbreaks and light and shade on plants.

THE MICROPHYSICAL WORLD, William Wilson, 216 pp., $3.75, Philosophical Library, New York, New York, 1954.

This book deals with the very small things in the physical world. The greatest part of it is devoted to present day knowledge about atoms and molecules, their structure and behavior. The book is addressed to the intelligent layman and is not burdened with mathematics.

Colchicine Polyploids

King-size grapes and apples, seedless watermelons, and disease-resistant radishes have been produced by treating the plants with the ancient anti-gout drug colchicine. In some cases, the result may be larger fruit, larger flowers, larger leaves, larger seeds. Fruit, for examples, may possibly be produced in increased yield, with better flavor, greater nutritional value, greater disease resistance. By the action of colchicine, sterile hybrids may in some cases be made fertile. Although colchicine can possibly produce changes of this type, the results thus far have fallen short of original expectations. Some early writers, confident in colchicine's ability to work biological miracles, were freely predicting that the drug would create an agricultural revolution. This, obviously, has not been the case.

Normal cells of most plants contain in their nucleus two identical sets of chromosomes. Before these normal so-called diploid cells divide, the chromosomes split lengthwise and each half migrates to opposite ends of the cell. The cell then splits in two, with each new cell containing the same number of chromosomes as the original. On the other hand, when a dividing cell is treated with colchicine, the chromosomes, after splitting in two in the usual way, do not migrate to opposite ends of the cell, and the cell itself does not divide. As a result, the number of chromosomes is doubled, forming the new tetraploid variety. All cells subsequently produced from this tetraploid also contain twice the usual number of chromosomes.

In Europe, triploid sugar beets—formed by crossing a colchicine-produced tetraploid beet with the conventional diploid variety—are said to yield 5 to 10 per cent more sugar than ordinary varieties. However, production of the high yielding triploid is difficult and costly, and may not give results sufficiently superior to other methods of increasing sugar beet yields.

In Japan, tetraploid radishes are reported to be larger than ordinary radishes and also more resistant to root disease.

British scientists describe tetraploid water cress as improved in flavor, succulence and vitamin C content, but not yet sufficiently attractive economically.

Swedish researchers have developed a tetraploid rye superior to conventional rye in the production of soft and hard breads. Distributed in the United States for the past two seasons, this grain is said to offer superior size, vigor and yield.

Seedless triploid watermelons, first produced commercially in Japan and later in this country, are reported to surpass ordinary watermelons in yield, sweetness, texture and storage qualities. Costs are relatively high.

Scientists of the U. S. Department of Agriculture have created more than 30 different tetraploid varieties of grapes—some resistant to disease. Tetraploid Loretto grapes are nearly three times as large as ordinary Loretto grapes.

The tetraploid of one variety of apple is almost twice the size of the diploid from which it was developed, although not very much larger than some conventional types of apple. It is reported that in some cases tetraploid apples have superior resistance in cold weather.

Experiments also are being conducted on colchicine modified corn, wheat, oats, rice, sorghum, flax, cotton, soybeans, tobacco, Chinese tallow nuts, strawberries, cranberries, peaches and pears.

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